

# Missouri Targets Advanced Manufacturing



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July 2011



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## Introduction

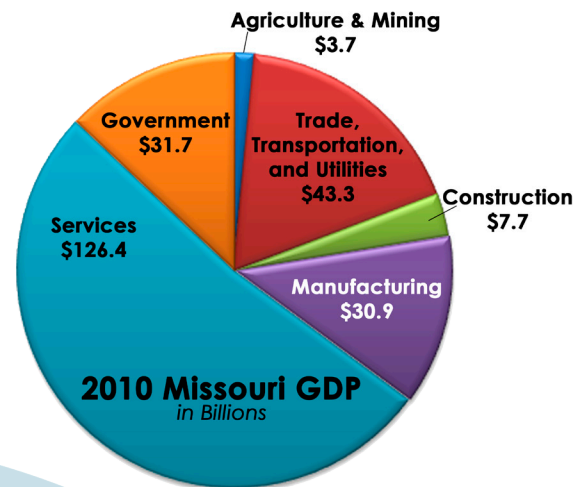
The Missouri Department of Economic Development launched its Strategic Initiative for Economic Growth in 2010. The purpose of the initiative was to identify high growth innovative industries in the state and target those industries in a way that spurs long-term economic growth and transforms the Missouri economy over the next five years. The Advanced Manufacturing industry was chosen to be one of seven broad industry targets. Other targets include Biosciences, Energy Solutions, Health Sciences and Services, Information Technology, Financial and Professional Services, and Transportation and Logistics.

## Manufacturing Matters

Regardless of how a manufacturer is defined, whether by its products or processes, the bottom line is that these businesses are a vital part of most economies. While goods producers have declined relative to services over the decades, the U.S. is still the global leader in manufacturing and most economic development strategies recognize its continued importance especially in the context of exports, wages, and innovation.

The products of most manufacturers are exported outside a region, to another state or country, so that new dollars are brought into a community. This export activity represents new income which is multiplied as local spending on materials, services, and labor flow through the region.

Manufacturers also pay higher wages than the typical business which results in greater spending on local consumer goods and services.



In 2010 manufacturers in Missouri employed 243,140 workers and contributed \$30.9 Billion to the state's overall Gross Domestic Product (GDP) of \$244 Billion. This represents 12.7% of GDP with 9.4% of the state's non-farm employment which again demonstrates the larger positive effect that manufacturers have on the economy.

Perhaps the strongest argument for manufacturing, however, is the innovation it drives. The on-going need to improve efficiencies and respond to the markets creates an environment of hands-on innovation where continuous improvements are a must. Being able to design, test, and redesign a product is at the heart of the scientific and manufacturing innovation that gives the U.S. a competitive advantage and is hard to bring back once production has moved overseas.



## Defining Manufacturing by Products, People, or Processes

The innovation engine, which pushes manufacturers to adapt and thrive, has spawned a new definition to describe the creative, technology-driven companies that promote long-term economic growth: *Advanced Manufacturing*. This term, however, can apply to manufacturing in a number of ways.

### Products

A truck is more complex than a loaf of bread! Makers of transportation equipment, for example, are considered *Advanced* when compared to simple products such as food items and can be identified using the North American Industry Classification System (NAICS). While using the NAICS product to define an advanced manufacturer is often valuable, another method focuses on the basic economics of who a company employs.

### People

Walk into a manufacturing plant and count the number of engineers and information technologists that work there and compare that to the plant's total workforce. Since these professionals are expensive to hire, it is one indicator of how advanced a manufacturer is. A company only employs these high cost workers in large numbers when advanced products or processes demand it.

This method of defining an advanced manufacturer uses staffing patterns and the percentage of occupations in mathematics, science, information technology, and engineering to determine how *Advanced* a typical manufacturer is. While no measure is perfect, this method is replicable to very detailed industry levels and improves on the process of counting only research and development spending which may mostly occur at headquarter operations.

### Processes

Finally, the processes a manufacturer uses can define it as *Advanced*, especially when viewed over time. While a food manufacturer, who makes a loaf of bread, is not considered *Advanced* when compared to a technology-intensive automobile maker, it undoubtedly is more advanced than the same industry ten years earlier or in a less developed country.

These less advanced, or traditional, manufacturers are still very important to the economy as large employers and as changes in technology continue to improve manufacturing processes. With time these firms, who typically locate near a natural or agriculture resource, will become more technologically intensive and can therefore thrive well into the future.

## Missouri Manufactures

Missouri has a range of manufacturers, from traditional to the very advanced, that together make the state a strong goods-producer and employ nearly 10 percent of the workforce.

Aerospace and automotive firms are an Advanced Manufacturing niche in Missouri but are supported by a large number of targeted, advanced producers that serve many other sectors.

Missouri has a traditional manufacturing sector that employs a large part of the state's workforce and will continue to move along the technology spectrum as processes evolve.

### Top Ten Employing Manufacturing Sectors

NAICS-Industry	Employment
311 - Food Manufacturing	38,860
336 - Transportation Equipment Mfg.	33,363
332 - Fabricated Metal Product Mfg.	28,319
333 - Machinery Manufacturing	25,549
325 - Chemical Manufacturing	16,922
326 - Plastics & Rubber Products Mfg.	14,900
323 - Printing & Support Activities	13,211
335 - Electrical Equip. & Appliance Mfg.	10,275
339 - Miscellaneous Manufacturing	8,108
322 - Paper Manufacturing	7,792

2010 Annual Average Employment, BLS QCEW



The table below shows direct employment in the Advanced Manufacturing niches of Aerospace and Motor Vehicle manufacturing. These two industries are supported by other advanced manufacturers, such as electrical equipment makers, who are integral parts of the state's target industries.

Manufacturing Groups	Employment	Percent
Aerospace and Defense Manufacturing	14,659	6%
Motor Vehicle and Parts Manufacturing	15,576	6%
Other Advanced/Target Manufacturing	90,121	37%
Traditional Manufacturing	122,784	50%
<b>Total Manufacturing</b>	<b>243,140</b>	<b>100%</b>

*2010 Annual Average Employment, BLS QCEW*

Traditional manufacturers represent half of all Missouri manufacturing employment and provide final goods or inputs to more advanced producers. These companies stand to gain from the growing global middle class that demands many of the products we take for granted like high-quality foods and basic infrastructure.

Manufacturing is a key driver of the state's economy. Two sectors, Aerospace and Motor Vehicle Manufacturing, have niche strengths in Missouri given the large employment and foreign exports these companies support. Just over 1,900 firms in these two sectors account for nearly 5% of the total private industry jobs in the state and pay above average wages of \$54,300.

In 2010 Aerospace and Motor Vehicle manufacturers accounted for \$2.9 Billion in exports, representing 25% of all goods flowing to foreign countries. Over the past few years these sectors have seen difficult times, particularly in the automotive industry with line and plant closings due to industry restructuring. In the past year employment has declined by 3.7 percent, somewhat mirroring the national decline of 2.4% over the same time period. Nevertheless, Missouri is beginning to turnaround with exports increasing and a number of niche sector manufacturing expansions and location announcements in the past months.

The remainder of this report looks at the employment, export, and workforce trends of Advanced Manufacturing, and will expand on the Aerospace and Motor Vehicle trends in the nine - state region.



# Advanced Manufacturing Industry Trends

## Industry Definition

The term Advanced Manufacturing refers to technology-intensive manufacturers with a higher than average proportion of workers involved in research and development. It also includes facilities that adopt new technologies in production and improvement of the manufacturing process. Among the many Missouri industries that comprise this sector, Aerospace, Defense and Transportation Equipment are examples of large employment niches in the state.

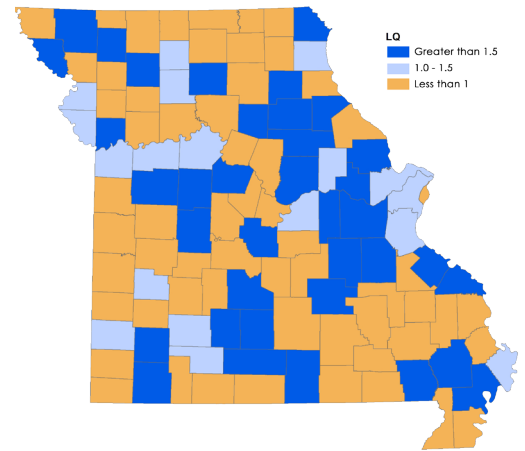
## Employers

Advanced Manufacturing includes a variety of high profile Missouri companies such as the Fortune 500 listed Emerson Electric and Graybar Electric. Other large employers include True Manufacturing, Honeywell, Marathon Electric, Briggs & Stratton, EFCO, Nordyne, Watlow, Noranda Aluminum, ABB, MEMC Electronic Materials, Harley-Davidson, Johnson Controls, and Kawasaki.

NAICS	Advanced Manufacturing
3169	Other Leather and Allied Product Mfg
3259	Other Chemical Product and Preparation Mfg
3261	Plastics Product Mfg
3262	Rubber Product Mfg
3313	Alumina and Aluminum Production and Processing
3314	Nonferrous Metal (except Aluminum) Production and Processing
3315	Foundries
3323	Architectural and Structural Metals Mfg
3324	Boiler, Tank, and Shipping Container Mfg
3329	Other Fabricated Metal Product Mfg
3333	Commercial and Service Industry Machinery Mfg
3334	HVAC and Refrigeration Equipment Mfg
3335	Metalworking Machinery Mfg
3336	Engine, Turbine, Power Transmission Equipment Mfg
3339	Other General Purpose Machinery Mfg
3341	Computer and Peripheral Equipment Mfg
3344	Semiconductor and Other Electronic Component Mfg
3345	Navigational, Measuring, Electromedical, and Control Instruments Mfg
3353	Electrical Equipment Mfg
3359	Other Electrical Equipment and Component Mfg
3361	Motor Vehicle Mfg
3362	Motor Vehicle Body and Trailer Mfg
3363	Motor Vehicle Parts Mfg
3364	Aerospace Product and Parts Mfg
3369	Other Transportation Equipment Mfg

## Employment

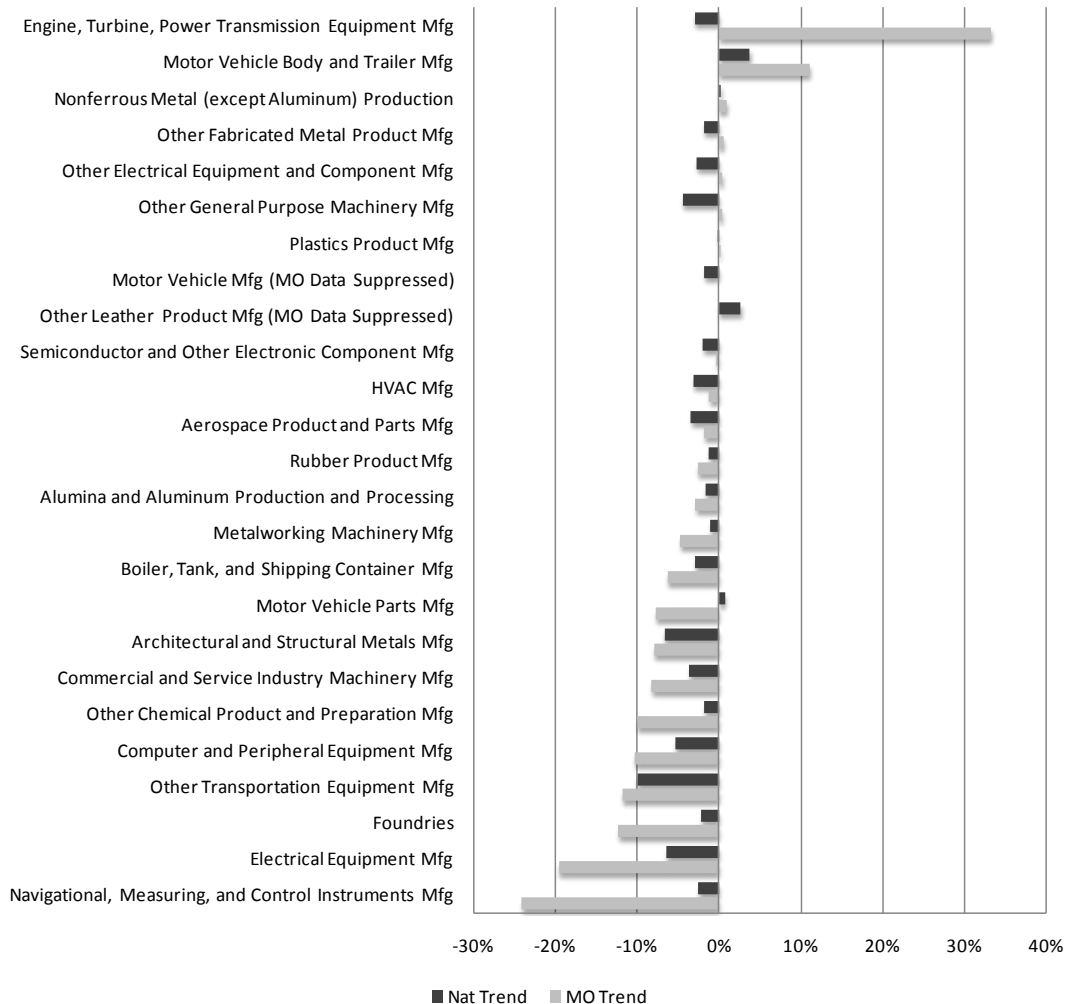
Advanced Manufacturing employment levels are highest in St. Louis County, the Kansas City region, and St. Charles County. Douglas, Ralls, Nodaway, and Laclede counties have the highest employment concentration in the state for Advanced Manufacturing industries when compared to the national industry mix; as the location quotient (LQ) map to the right illustrates (see methodology for more details).



**County Dependence on Advanced Manufacturing**

Missouri private employment in this sector has declined over the year by -3.7%, somewhat mirroring the national trend of -2.4%. Within this cluster, manufacturers of engines/turbines/transmissions, motor vehicle trailers, nonferrous metals, fabricated metals, electrical equipment, machinery, and plastic products are all showing positive gains. The engines/turbines/transmissions and the motor vehicle trailer sectors have shown the largest percentage gains over the year; 33.2% and 11.1% respectively.

## Advanced Manufacturing Employment Trends 2009-2010





# Advanced Manufacturing Employment Trends 2009-2010

## Large Employing Growth Industries

Truck trailer mfg All other plastics product mfg Storage battery mfg Motor vehicle seating and interior trim mfg Industrial mold mfg	Positive Growth High Concentration Growth Beyond National Industry Trends
Secondary processing of other nonferrous metals Small arms ammunition mfg Plastics packaging film and sheet mfg	Positive Growth High Concentration Growth Less than National Industry Trends
AC, refrigeration, and forced air heating Other engine equipment mfg Other commercial and service machinery mfg Miscellaneous fabricated metal product mfg Rubber and plastics hose and belting mfg	Positive Growth High Concentration Growth in Nationally Declining Industry

## Emerging Industries

Urethane and other foam product mfg Motor vehicle metal stamping Carburetor, piston, ring, and valve mfg Printed circuit assembly mfg	Positive Growth Low Concentration Growth Beyond National Industry Trends
Aluminum sheet, plate, and foil mfg	Positive Growth Low Concentration Growth Less than National Industry Trends
Industrial valve mfg Elevator and moving stairway mfg Steel foundries, except investment	Positive Growth Low Concentration Growth in Nationally Declining Industry

## Large Employing Industries with Declining Growth

Air purification equipment mfg All other leather good mfg Primary nonferrous metal, except CU and AL All other rubber product mfg Primary battery mfg	Negative Growth High Concentration Declines in Nationally Growing Industry
Primary aluminum production Other aircraft parts and equipment Noncurrent-carrying wiring device mfg	Negative Growth High Concentration Declines Less than National Industry Trends
Metal forming machine tool mfg Other miscellaneous chemical product mfg Automatic environmental control mfg	Negative Growth High Concentration Declines Beyond National Industry Trends

## Smaller Employing Industries with Declining Growth

Motor vehicle steering and suspension parts Aluminum die-casting foundries Gasoline engine and engine parts mfg	Negative Growth Low Concentration Declines in Nationally Growing Industry
Fabricated structural metal mfg Other electronic component mfg Semiconductors and related device mfg	Negative Growth Low Concentration Declines Less than National Industry Trends
Sheet metal work manufacturing Nonpackaging plastics film and sheet mfg Motor vehicle body mfg	Negative Growth Low Concentration Declines Beyond National Industry Trends

## Workforce

Missouri's Advanced Manufacturing occupations are primarily made up of Production Line positions (58%), Engineers (8%), Admin. Support (7%), and Transport and Warehousing Services (6%). This occupational mix is projected to remain very similar over the next 10 years. Of the Advanced Manufacturing occupations projecting growth over the next decade, Production Line workers are expected to make up over 64% of the growth with Engineering Services and IT Services constituting 14% and 13% respectively. Wages for the prospective growth occupations are estimated to average nearly \$46,000. Occupations experiencing the most growth over this time period include Computer-Controlled Machine Tool Operators, Machine Setters/Operators and Computer Software Engineers. Team assemblers, machinists, and welders are expected to hold the largest number of jobs over the next decade.

### Top Occupations by Projected Growth 2008-2018

Advanced Manufacturing Occupations	Typical Education	Average Wage
<b>Production</b>		
Computer-Controlled Machine Tool Operators, Metal and Plastic Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	Moderate-term on-the-job training	\$30,455
Mixing and Blending Machine Setters, Operators, and Tenders	Moderate-term on-the-job training	\$29,528
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	Moderate-term on-the-job training	\$35,133
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	Moderate-term on-the-job training	Not Available
<b>Engineering</b>		
Industrial Engineers	Bachelor's degree	\$71,352
Materials Engineers	Bachelor's degree	\$86,971
Aerospace Engineers	Bachelor's degree	Not Available
<b>IT Services</b>		
Computer Software Engineers, Applications	Bachelor's degree	\$76,059
Network Systems and Data Communications Analysts	Bachelor's degree	\$74,788
<b>Support Services</b>		
Cost Estimators	Bachelor's degree	\$57,688
Logisticians	Bachelor's degree	\$65,784
Purchasing Agents, Except Wholesale, Retail, and Farm Products	Long-term on-the-job training	\$52,686
Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	Long-term on-the-job training	\$50,250
Market Research Analysts	Bachelor's degree	\$61,898

Source: BLS Occupational Employment Survey and MERIC Projections

Analysis of education and experience levels typically required by all occupations in the Advanced Manufacturing sector shows that 13.9% are considered lower skilled, 60% are middle skilled, and 26.1% are high skilled. Middle to high skill occupations make up 86.1% of Advanced Manufacturing jobs, which is considerably higher than the 63.6% average for all occupations in Missouri.

A skilled workforce is widely recognized as a key competitive advantage of the United States and all states, including Missouri, rightly view this as an important area of focus. According to a 2009 Manufacturing Institute survey, over half of all U.S. manufacturers (51%) reported moderate to serious shortages in skilled production workers while over a third (36%) reported the same problem in finding scientists and engineers. These shortages existed even while a devastating recession put many people out of work. The same survey showed 63 percent of Aerospace and Defense firms had a moderate to serious employee shortage across all skills while Automotive was much lower at 3 percent (See Sources for more details).

## Missouri Exports

Missouri's export mix has a higher concentration of Advanced Manufacturing commodities than the national average. This sector's export value makes up over 44% of the total Missouri commodity base and has shown a healthy growth of 15% over the year, approximately 10% higher than the national trend.

The state's biggest exporting industries in this sector include motor vehicles, general purpose machinery, aerospace products and parts, and motor vehicle parts. Compared to national averages, the state also has high export concentrations in the areas of HVAC equipment, motor vehicles, architectural and structural metals, and electrical equipment.

With nearly half of this sector's commodities surpassing the nation in growth, employment possibilities are likely to increase, particularly in the hard hit sector of motor vehicle manufacturing. The table below highlights the over the year trends in Advanced Manufacturing commodities and shows the specific areas of growth as well as lagging exporters.

NAICS	TOTAL ALL INDUSTRIES TOTAL ALL ADVANCED MANUFACTURING INDUSTRIES	APR 2011 YTD MO EXPORTS	%2010- 2011 US	%2010- 2011 MO	Adv. Manuf Growth (MO over US)	Adv. Manuf MO Export LQ
		\$4,670,887,703	19.06	19.26		
		\$2,066,589,922	13.62	14.95	1.10	1.07
<b>High Growth / High Concentration</b>						
3361	Motor Vehicles	\$738,557,400	19.2	32.7	1.71	3.79
3339	Other General Purpose Machinery	\$170,614,275	20.1	51.7	2.57	1.38
3329	Other Fabricated Metal Products	\$110,647,219	20.1	45.1	2.25	1.45
3336	Engines, Turbines, And Power Transmission Equipment	\$109,491,041	14.4	14.9	1.04	1.27
3353	Electrical Equipment	\$58,308,759	13.2	64.1	4.86	1.18
3262	Rubber Products	\$33,795,313	19.1	60.1	3.15	1.10
3323	Architectural And Structural Metals	\$17,032,873	11.9	115.3	9.72	2.47
<b>High Growth / Low Concentration</b>						
3363	Motor Vehicle Parts	\$128,376,459	16.2	28.7	1.77	0.76
3344	Semiconductors And Other Electronic Components	\$61,744,988	1.1	13.6	12.16	0.31
3261	Plastics Products	\$53,050,239	11.8	20.7	1.76	0.86
3341	Computer Equipment	\$20,460,583	13.3	15.0	1.13	0.14
3362	Motor Vehicle Bodies And Trailers	\$9,758,913	15.8	189.2	11.95	0.85
<b>Low Growth / High Concentration</b>						
3359	Electrical Equipment And Components, Nesoi	\$120,333,994	15.5	-23.3	-1.50	2.06
3334	HVAC And Commercial Refrigeration Equipment	\$91,449,788	13.3	2.7	0.20	3.85
3324	Boilers, Tanks, And Shipping Containers	\$11,714,218	24.1	-3.8	-0.16	1.10
<b>Low Growth / Low Concentration</b>						
3364	Aerospace Products And Parts	\$153,736,160	3.2	-22.5	-7.13	0.59
3345	Navigational, Measuring, And Control Instruments	\$62,575,383	13.8	-33.1	-2.41	0.41
3314	Nonferrous Metal (Except Aluminum) And Processing	\$35,092,645	35.4	17.7	0.50	0.26
3335	Metalworking Machinery	\$22,862,968	31.6	27.1	0.86	0.92
3313	Alumina And Aluminum And Processing	\$21,221,661	33.0	-36.6	-1.11	0.87
3333	Commercial And Service Industry Machinery	\$17,554,740	5.2	-0.8	-0.15	0.56
3259	Other Chemical Products And Preparations	\$10,565,982	17.4	9.6	0.55	0.28
3369	Transportation Equipment, Nesoi	\$5,654,930	-0.7	-28.3	42.22	0.56
3169	Other Leather Products	\$1,331,228	5.1	-14.9	-2.95	0.34
3315	Foundries	\$658,163	15.0	-88.4	-5.91	0.19

NESOI: Not either Specified or Included

## Midwest Export Trends

Year-to-date 2011 export figures rank Missouri 4th in Advanced Manufacturing export values in the Midwest region (Missouri and surrounding states). Illinois is experiencing the highest percentage growth of the surrounding states at 25 percent. Oklahoma and Kentucky have the highest reliance on Advanced Manufacturing exports with percentages to total export commodities in each state of 56% and 55% respectively.

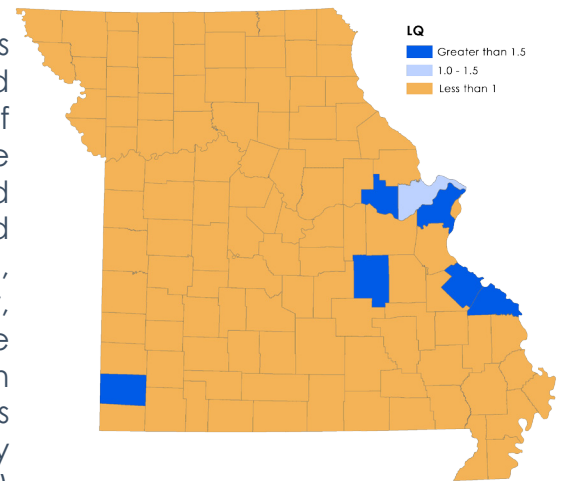


# Advanced Manufacturing

## Aerospace Manufacturing

### Employment

Aerospace products and parts represent 7% of all Missouri Advanced Manufacturing exports and 13.5% of the sector's employment. Aerospace private employment is mainly located in the St. Louis, Kansas City, and Southwest regions of the state. Warren, St. Louis County, Ste. Genevieve, Perry, Crawford, and Newton counties have a higher than average concentration of Aerospace manufacturing firms compared with the national industry mix; as the location quotient (LQ) map to the right illustrates (see methodology for more details).



**County Dependence on Aerospace Manufacturing**

### Employers

Prominent employers in this sector include manufacturers such as Integrated Defense Systems (IDS)/Boeing Company, Alliant Techsystems, Westar, United Technologies, GKN Aerospace, Sabreliner Corporation, LMI Aerospace, and Dallas Airmotive/BBA Aviation. Other smaller firms in this industry include Leonard's Metal, Seyer Industries, and Steelville Manufacturing.



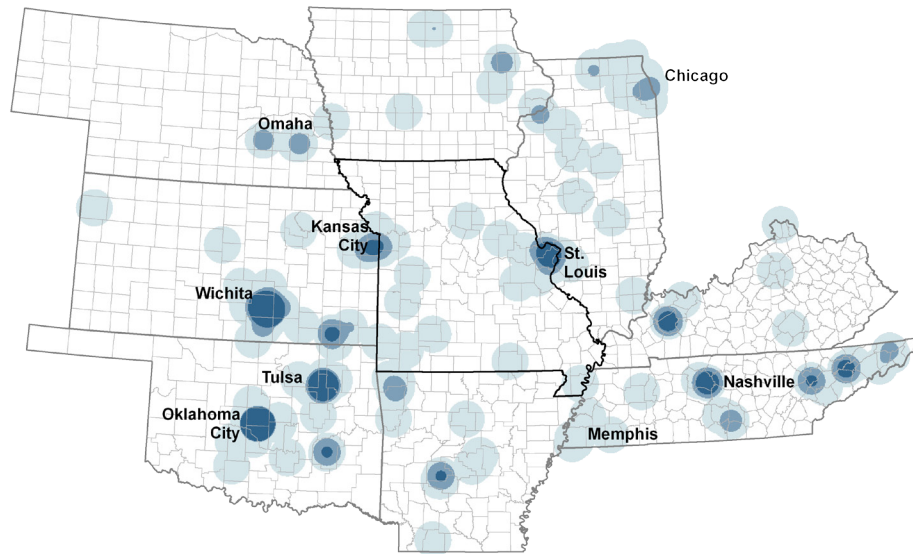
## Midwest Employment Trends

Missouri ranks second behind Kansas in Aerospace Manufacturing sector employment within the Midwest with nearly 23% of the total non-farm employment in the nine-state area. The regional map highlights the areas of heavy employment density for Aerospace product and parts manufacturing.

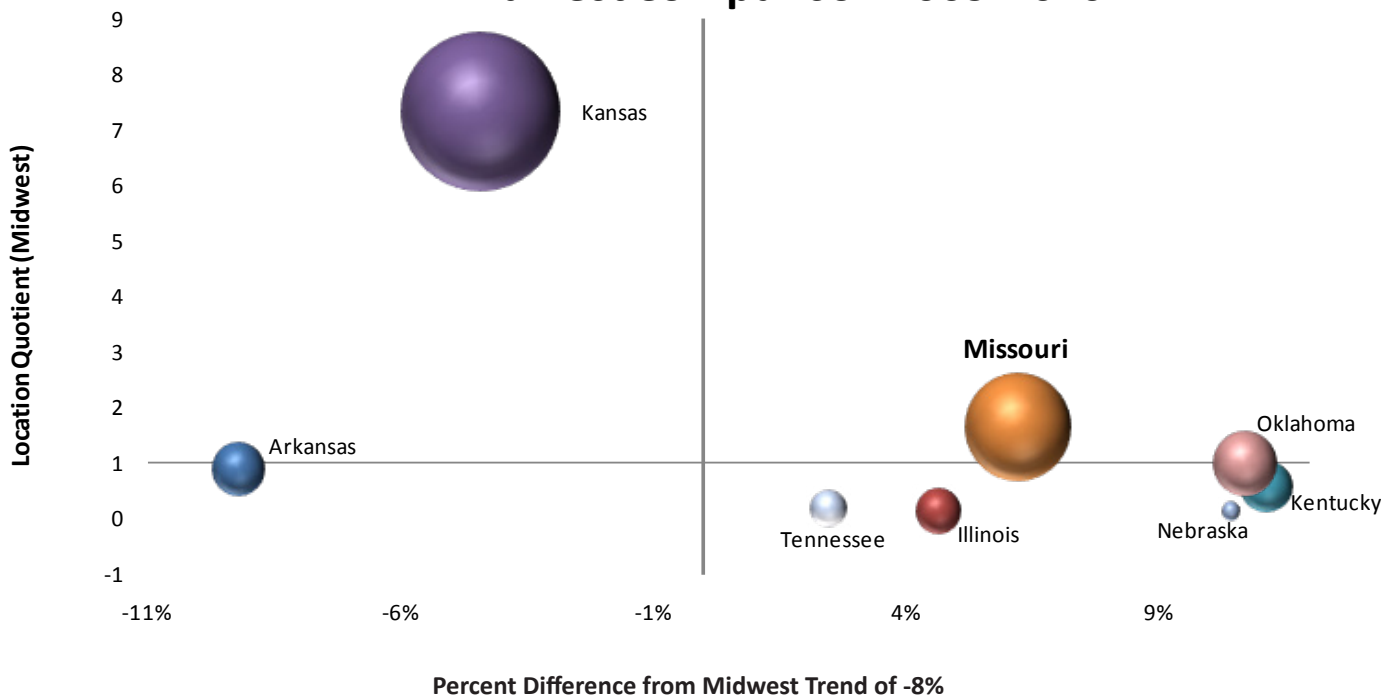
Missouri public and private sector employment trends over the year are down -1.8% for this cluster. The Midwest over the year trend is much lower at an estimated -8.0%.

Kansas, with over half of the region's employment in this sector, sustained the biggest job loss at -12.4%. Arkansas also incurred a loss of -17.2%. Kansas and Missouri have the highest employment concentrations of the Midwest states. While five of the states experienced losses over the year in this sector, Kentucky, Oklahoma, and Nebraska had gains between 2.5-3.5%.

## Regional Aerospace Employment



## Aerospace Product and Parts Employment Midwest Comparison 2009-2010

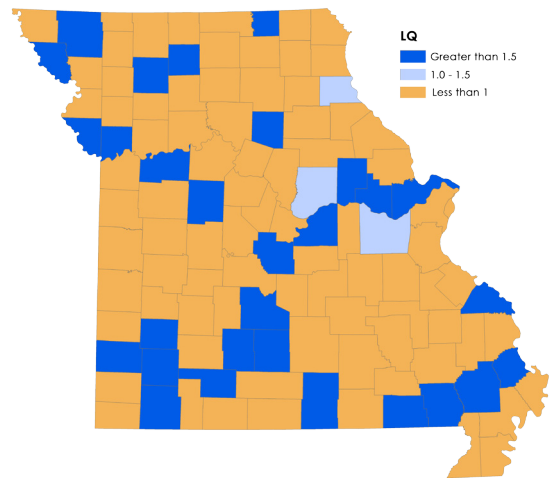


# Advanced Manufacturing

## Motor Vehicle and Parts Manufacturing

### Employment

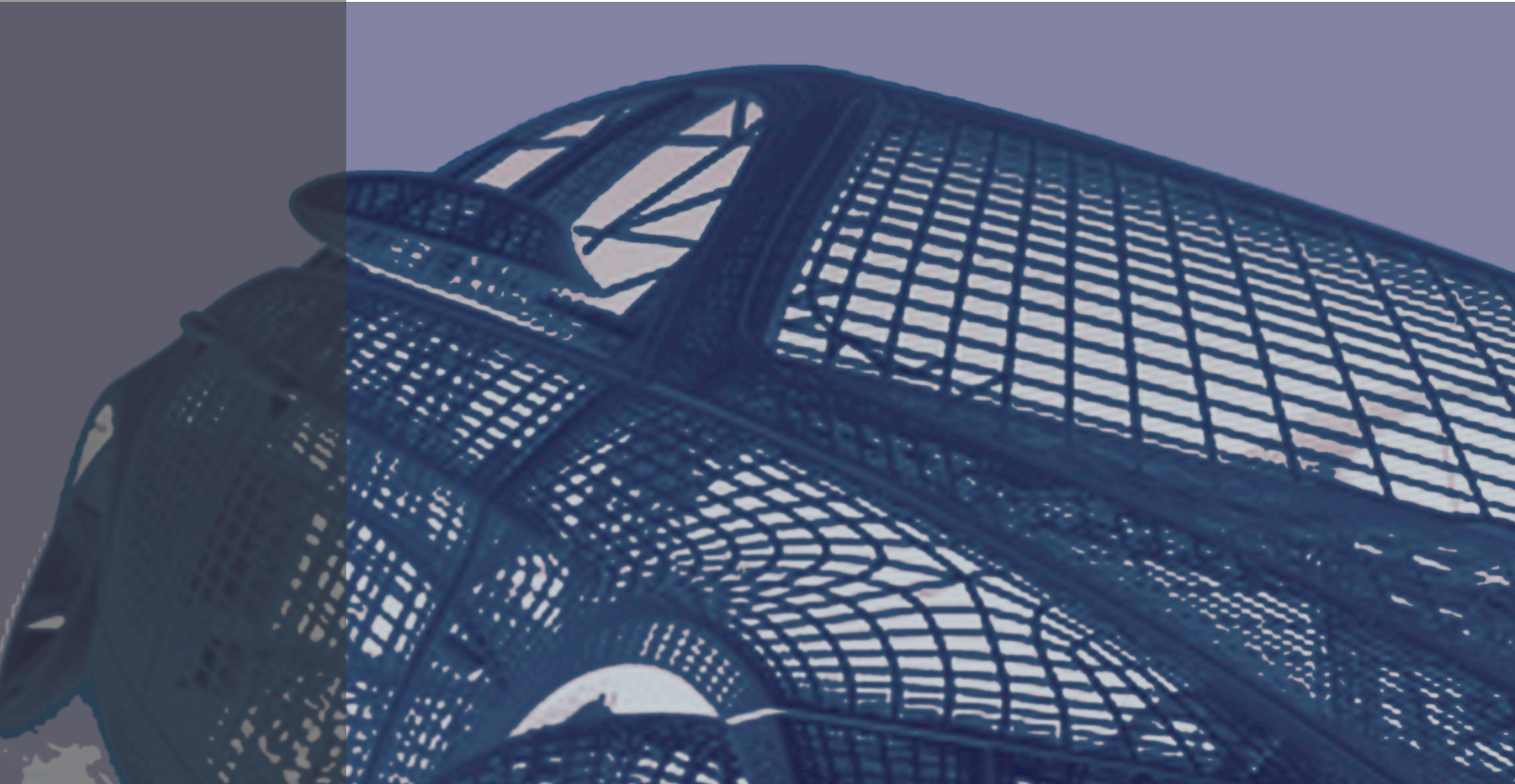
Motor Vehicle and Parts Manufacturing represent 42% of all Missouri Advanced Manufacturing exports and 14.3% of the sector's employment. Motor Vehicle and Parts private employment is mainly located in the St. Louis, Kansas City, and Southwest regions of the state. However, many counties across all regions of the state have a higher than average concentration of motor vehicle and parts firms based on location quotient analysis (see methodology for more details).



County Dependence on  
Motor Vehicle Manufacturing

### Employers

Missouri's top employers in the Motor Vehicle and Parts industry include automotive mainstays Ford (Claycomo assembly plant) and General Motors (Wentzville assembly Plant). Missouri also has a variety of large employing businesses that supply the transportation industry with parts and components. These businesses include Emcom Technologies (Dexter & Riverside), Hayes Lemmerz (Sedalia), Toyoda-Gosei (Perryville), EaglePicher Technologies (Joplin), Lear Operations (Hazelwood), and Able Manufacturing and Assembly (Joplin).





## Midwest Employment Trends

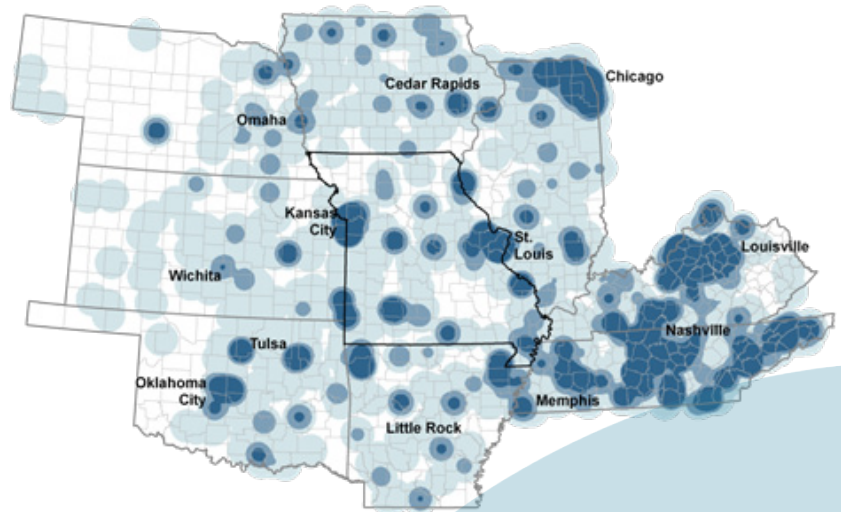
Missouri ranks fourth in Motor Vehicle and Parts employment within the Midwest with over 10% of the total non-farm employment in the area. The regional map highlights the areas of heavy employment density for the automotive manufacturing sector.

Missouri public and private sector employment trends over the year are down -7.0% for this cluster. The Midwest over the year trend is showing a gain estimated at 0.4%.

Kentucky and Tennessee employment trends have been consistent with the overall Midwest trend in Motor Vehicle and Parts Manufacturing. Kentucky, Tennessee, and Iowa have the highest employment concentrations of the Midwest states. Four states have incurred losses over the year in this sector, Missouri and Oklahoma fell below the Midwest average. Kansas with relatively low employment and industry concentration fared better with over the year gains estimated at 15%. Iowa, Illinois, Arkansas, and Nebraska also showed gains between 1.5% and 7.0%.

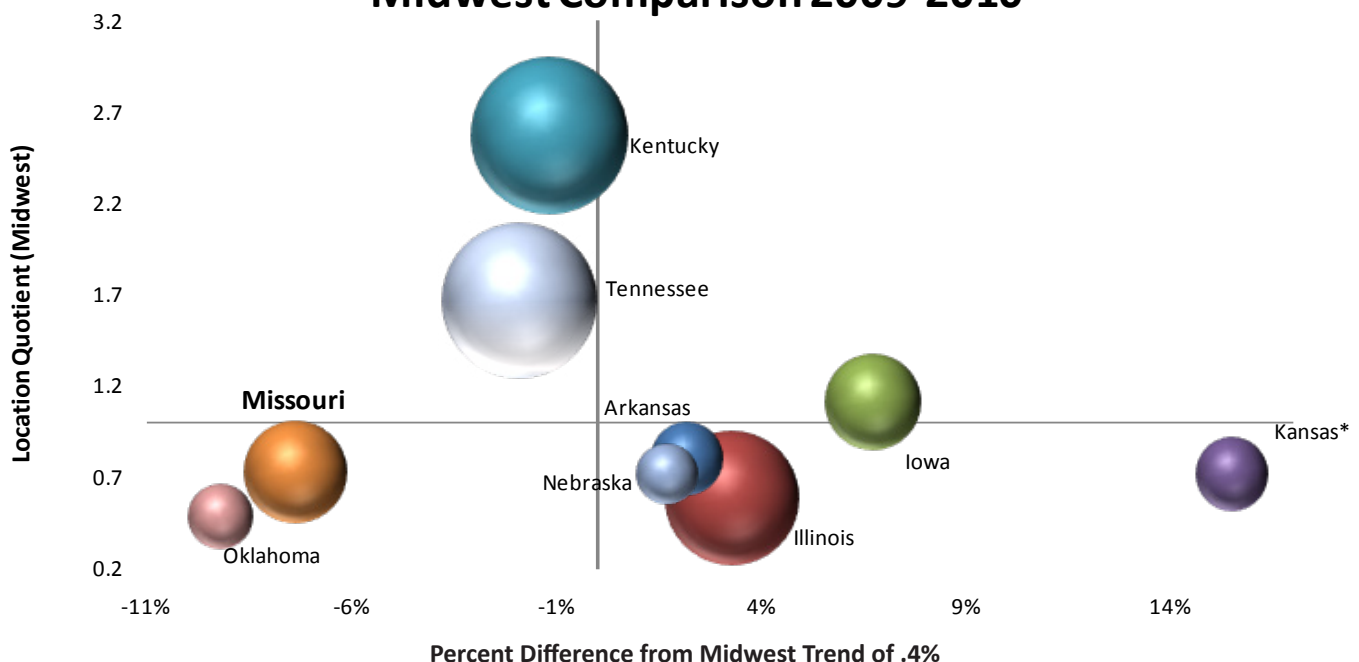
Missouri has been facing challenges in this sector over the last five years; however, all three export categories in this sector are experiencing substantial gains so far this year with Motor Vehicle exports surpassing the national trend.

## Regional Automotive Employment



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## Automotive Manufacturing Employment Midwest Comparison 2009-2010



\*Kansas motor vehicle employment data for 2010 was suppressed; employment was estimated using the change in the broader 336 NAICS excluding the Aerospace industry.

## Sources

- U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages
- U.S. Bureau of Labor Statistics, Occupational Employment Survey
- MERIC, Long Term Occupational Projections 2008-2018
- Reference USA Business Database
- WiserTrade Export Data
- Industry Definitions provided by Market Street Consultants, Excluding Services
- Missouri Target Cluster Analysis, March 2011.
- Deloitte, Oracle, and The Manufacturing Institute, "People and Profitability Study: A Time for Change." 2009.

## Methodology

### *Location Quotients*

**Location quotient (LQ)** is a statistical measure of an industry concentration. The quotient indicates the geographical concentration of an industry in a area as a function of the expected concentration based on national average. Location Quotient was calculated using the BLS Regional Data Analysis Tool (RDAT). The LQ formula is:

$$\left( \frac{\text{Area Industry Emp.}}{\text{Area Total Emp.}} \right) / \left( \frac{\text{U.S. Industry Emp.}}{\text{U.S. Total Emp.}} \right)$$

LQ>1 indicates an industry concentration.

LQ=1 indicates expected concentration based on U.S. average.

LQ<1 indicates no industry concentration.

## About MERIC:

MERIC is the research division for the Missouri Department of Economic Development. We provide innovative analyses and assistance to policy makers and the public, including studies of the state's targeted industries and economic development initiatives. Our mission is to deliver value-added research with a customer focus.

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